# Stimulating and Revealing Technological Innovations in Academic Institutions

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**Vice-President of National Academy of Sciences**

**Republic of Armenia**

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# The role of National Academy of Sciences of Armenia (NAS RA)

Two important factors determining the role of National Academy of Sciences of Armenia (NAS RA) in stimulating the innovative way of Armenia development under current conditions:

- **Rating the commercial potential of academic institutions**
- **Revealing most perspective innovation projects.**

# Inventory of results in applied research

Some preparatory measures were performed in 2009-2011 which fit to the plans of the government on acceleration of the science and technology application for economical development of Armenia. Particularly, an inventory of results in applied research was carried out in academic institutes, as well as a set of projects/proposals promoting technological development of Armenia has been developed. **Mainly proposals are focused to biological systems, new materials, information systems, rational use of natural resources and**

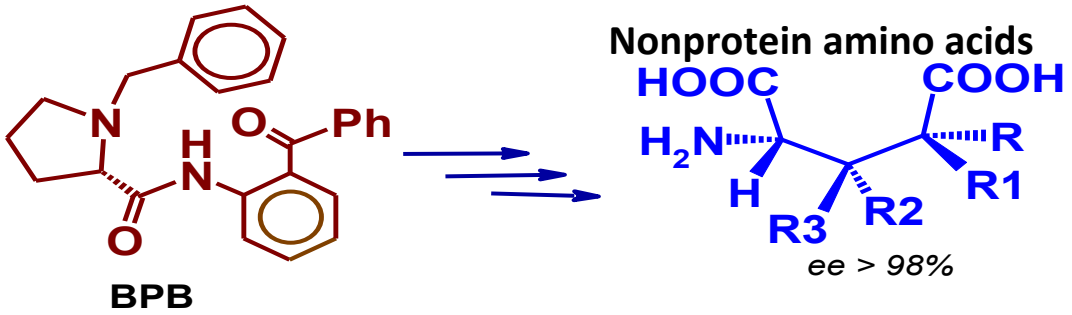
# SCIENTIFIC AND PRODUCTION CENTER "ARMBIOTECHNOLOGY"

## Main scopes of activity

- Researches in the field of biotechnology, general and applied microbiology
- Technologies development and optimization
- Synthesis and production of biological active compounds and preparations
- Education and publishing
- Grants and contracts

# The universal technology for the asymmetric (biomimetic) synthesis of nonprotein amino acids

***Developer and manufacturer*** **SPC "Armbiotechnology", NAS of RA**




***Technology advances:*** optical, chemical purity, repeated use of initial raw material, low prices; ***Application:*** medicine, pharmacology, PET-diagnostics;

***Customers:*** *Acros Organics, Belgium; Bachem, Germany*; *Sigma; "FNG Invest" Ltd, Latvia*.

**Amino Acid (Glycine)**
**1 kg ≈ US$ 10.00**

→

**Nonprotein Amino Acids**
**1 g ≈ US$ 250.00**

**"ACROS ORGANICS"**
**1 g ≈ US$ 900.00**

**>**

**SPC Armbiotechnology**
**1 g ≈ US$ 250.00**

# “AZOZEOVIT-1” as the universal complex biofertilizer

**“Azozeovit-1” is the complex biofertilizer consisting of high active free-living nitrogen-fixing bacteria (*Azotobacter chroococcum*) and zeolites (natural mineral) developed at the Center by novel biotechnology**. ***Developer:*** **SPC “Armbiotechnology”, NAS of RA, *Manufacturer:* “SIS-95” Ltd. Co.**

***Application:***

- treatment of seeds, seedlings, planting stock, cereals, vegetables and melons, industrial, fodder, fruit and berry cultures, decorative and indoor plants;
- soil fertilizing.

***Advantages of preparation***

High efficiency
Action duration
Early technical and biological ripening of crop
Rise of crop *(up to 60%)*
Plants diseases increasing
Nitrates reduction in agriculture products
Ecological safety
Water consumption saving
Portability and soil regeneration
Low price

# INSTITUTE FOR PHYSICAL RESEARCH NAS RA

## Scintillation crystals based on lutetium aluminum garnet doped with cerium (LuAG:Ce) for medical imaging and high energy physics applications

**Growth method – vertical Bridgman**

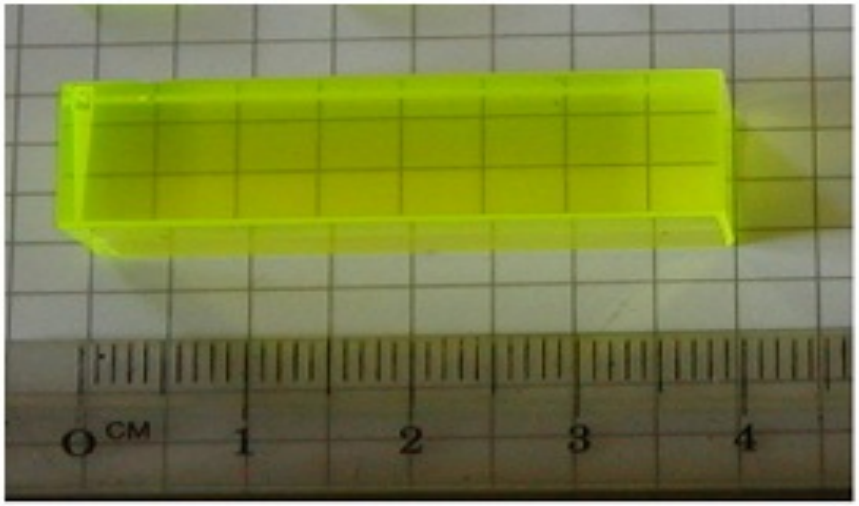
**Characteristics**

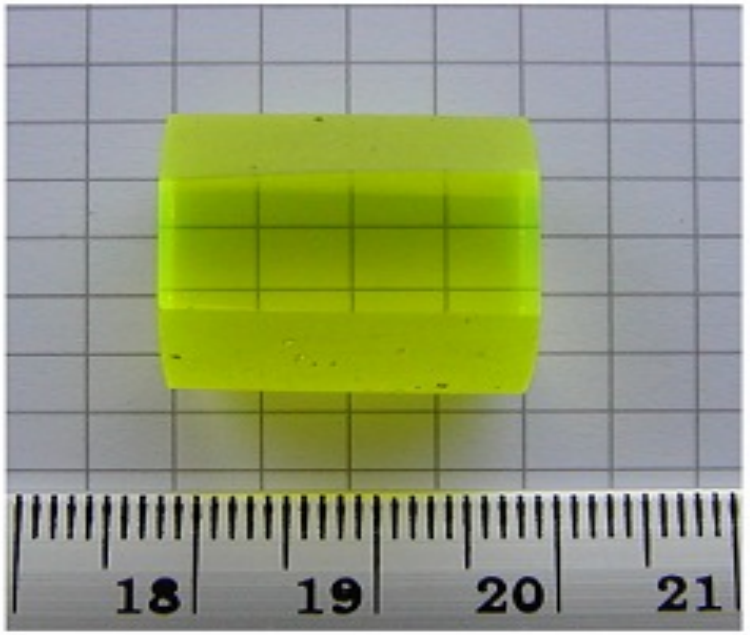
- **Density: 6.73 g/cm$^3$**
- **Refractive index (589 nm): 1.842**
- **Optimal Ce concentration: ≥ 0.3 at%**
- **Emission wavelength: 510-530 nm**
- **Light yield: ≥ 25000 ph/MeV**
- **Decay (fast component): 55-65 ns**
- **Energy resolution (FWHM): 13-14 %**

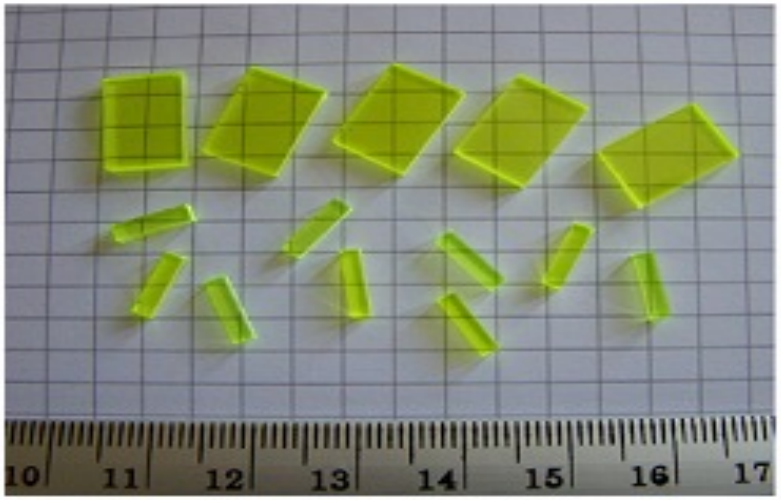
*For future information or questions please contact*

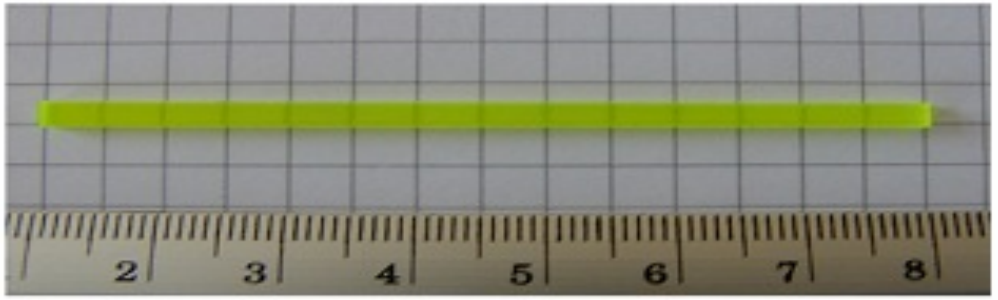
*Prof. Ashot Petrosyan, Head of Laboratory*

# Scintillation crystals



# INSTITUTE OF CHEMICAL PHYSICS NAS RA

## The technological process of production of ALLOYS OF REFRACTORY METALS IN «HYDRIDE CYCLE»

- «Hydride cycle» is an earlier unknown effective method of formation of refractory metal alloys.
- *Current methods* of alloys producing are based on the technologies of fusion (induction, electrical arc or electron-beam), or powder metallurgy and mechano-chemistry. All these technologies are technically difficult, laborious, long-term, multi-stage and demand high temperature (1800-2500$^{o}$C), etc.
- *"Hydride cycle" method* of alloys formation takes place at lower temperature (700-1000$^{o}$C), and short exposition (no more than two hours

**Advantages of technology:**

- low power inputs (without melting);
- high productivity waste-less process, high quality binary and multi-component alloys and intermetallides of given composition;
- not expensive row materials: SHS hydrides made from sponge and chips (waste of mechanical treatment of refractory metals);
- the “hydride cycle” in association with SHS is a successful way for creation of new compositions of alloys of improved physical and chemical characteristics

*For future information or questions please contact*

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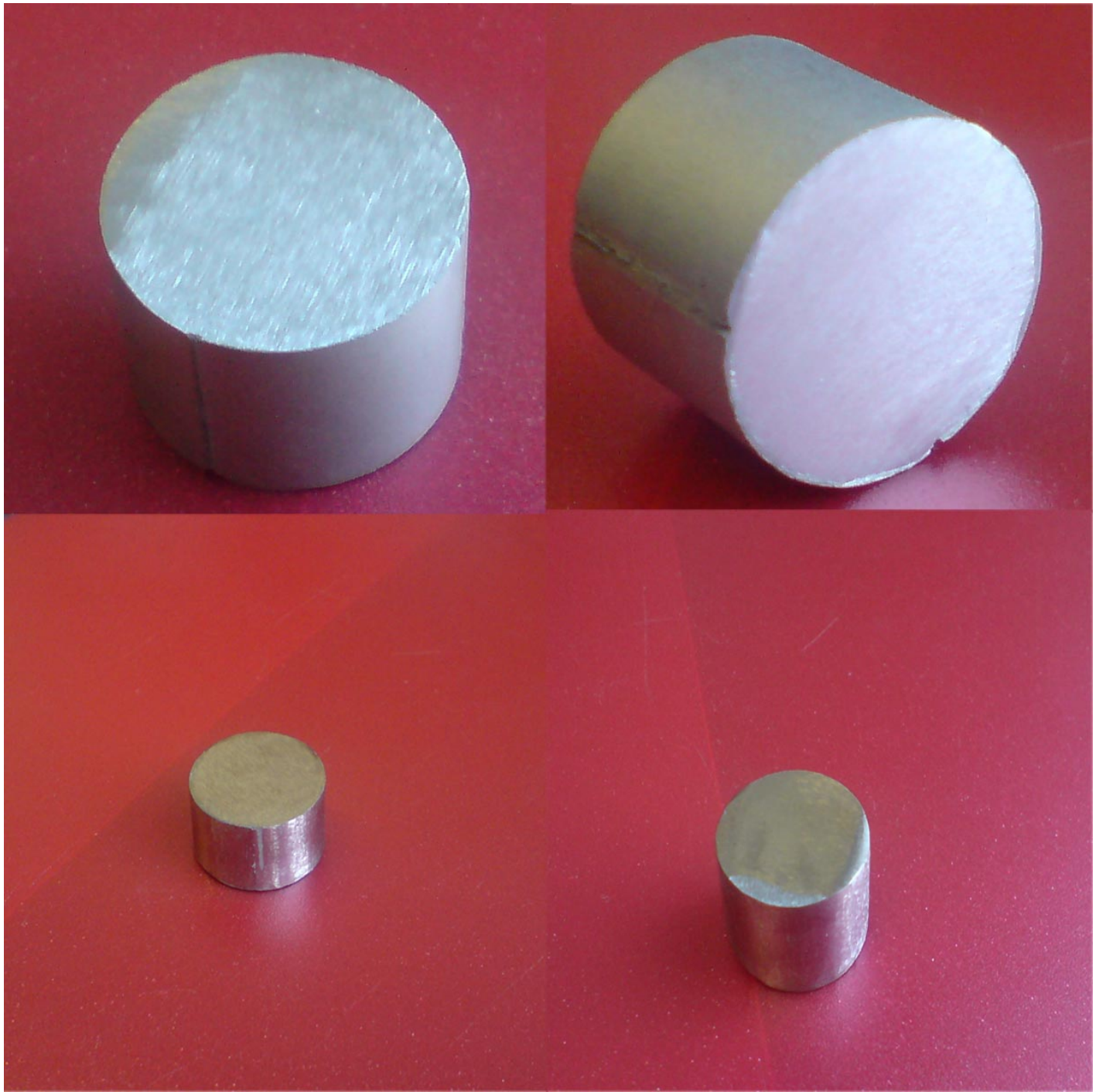
*E-mail: seda@ichph.sci.am*

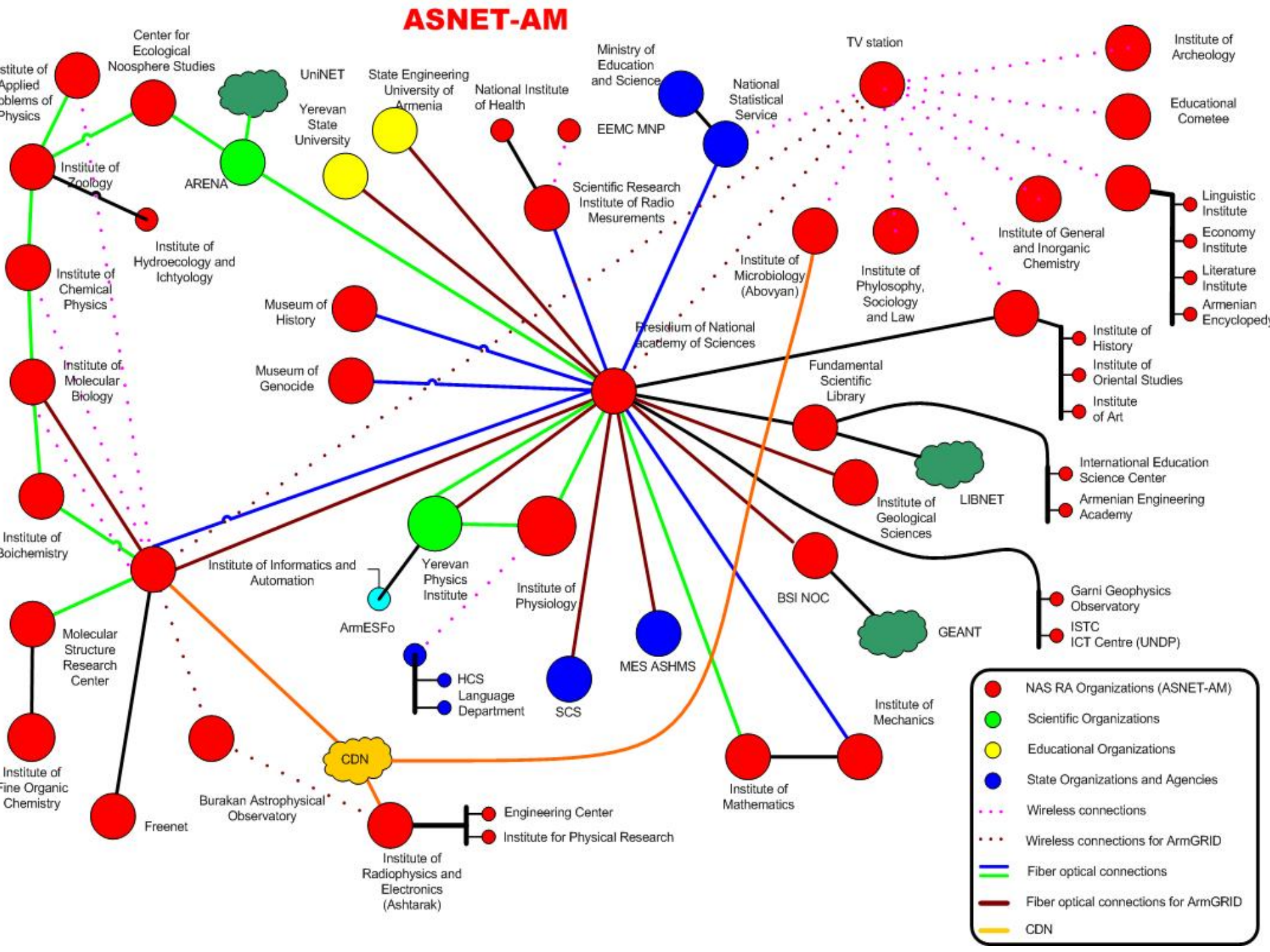


# INSTITUTE FOR INFORMATICS AND AUTOMATION PROBLEMS NAS RA

## Development of Advanced Information and Computation Environment in Armenia

- ***Academic Scientific Network of Armenia (ASNET-AM)***
  **ASNET-AM** was started to develop and realize since 1994 by the **Institute for Informatics and Automation Problems (IIAP NAS RA).** The international connection for ASNET-AM is provided by GEANT.
- ***Grid Activities in Armenia*** **ArmNGI** represents an effort to establish a sustainable national Grid infrastructure in Armenia.

  *The main aims are: to create a national GRID development policy to build up the national grid infrastructure to expand the high performance computing resources with collaboration of academic and commercial participants to give the information to the national user community to participate in the international grid projects actively*

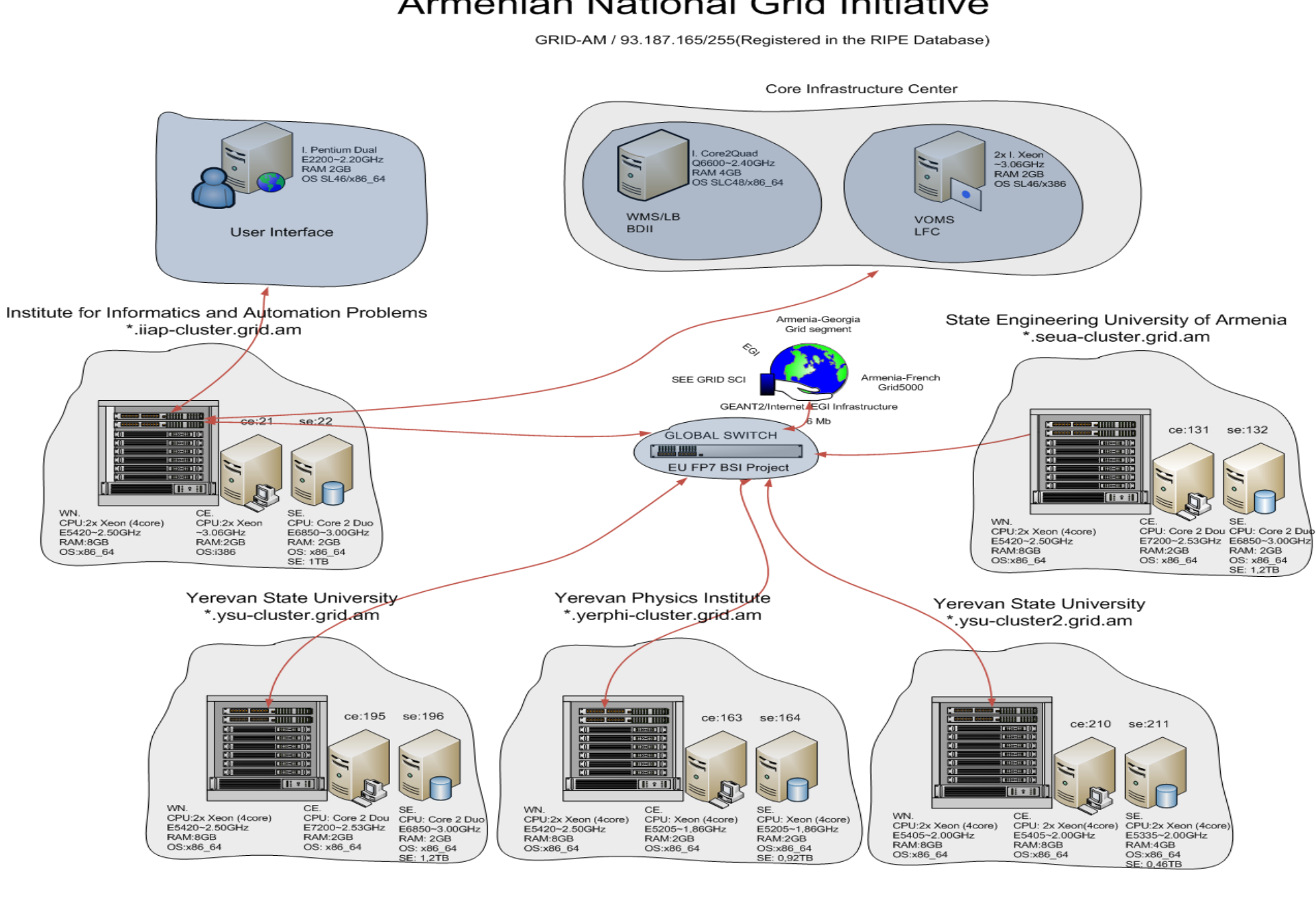

ASNET-AM
Center for Ecological Noosphere Studies
UniNET
State Engineering University of Armenia
Ministry of Education and Science
National Institute of Health
TV station
Institute of Archeology
Educational Cometee
Yerevan State University
EEMC MNP
National Statistical Service
Institute of Zoology
ARENA
Scientific Research Institute of Radio Mesurements
Linguistic Institute
Economy Institute
Literature Institute
Armenian Encycloped
Institute of Hydroecology and Ichtyology
Institute of Microbiology (Abovyan)
Institute of Phylosophy, Sociology and Law
Institute of General and Inorganic Chemistry
Institute of Chemical Physics
Museum of History
Presidium of National academy of Sciences
Institute of History
Institute of Oriental Studies
Institute of Art
Museum of Genocide
Institute of Molecular Biology
Fundamental Scientific Library
International Education Science Center
Armenian Engineering Academy
LIBNET
Institute of Geological Sciences
Institute of Informatics and Automation
Yerevan Physics Institute
Institute of Physiology
BSI NOC
Garni Geophysics Observatory
ISTC
ICT Centre (UNDP)
GEANT
ArmESFo
MES ASHMS
HCS
Language Department
SCS
Molecular Structure Research Center
Institute of Mechanics
CDN
Institute of Mathematics
Burakan Astrophysical Observatory
Freenet
Engineering Center
Institute for Physical Research
Institute of Radiophysics and Electronics (Ashtarak)
NAS RA Organizations (ASNET-AM)
Scientific Organizations
Educational Organizations
State Organizations and Agencies
Wireless connections
Wireless connections for ArmGRID
Fiber optical connections
Fiber optical connections for ArmGRID
CDN

# Grid Activities in Armenia: ArmNGI Overview

- Agreement of Establishment of Armenian Grid Joint Research Unit was signed in September 2007
- ArmNGI Foundation Kick-off meeting in October 2008

- State Scientific Committee of the Ministry of Education and Science
- National Academy of Sciences
- State Engineering University of Armenia
- Yerevan State University
- Yerevan Physics Institute after A. Alikhanian
- Institute for Informatics and Automation Problems of the National Academy of Sciences
- Armenian e-Science Foundation

# Grid Activities in Armenia: Topology



| Institution | Number of Cores | Net. Topology |
|---|---|---|
| IIAP NAS RA | 176 | Myrinet<br>Gigabit |
| YSU | 176 | Infiniband<br>Gigabit |
| SEUA | 48 | Gigabit |
| YERPHI | 48 | Gigabit |
| TOTAL | 448 | |

# International Collaboration



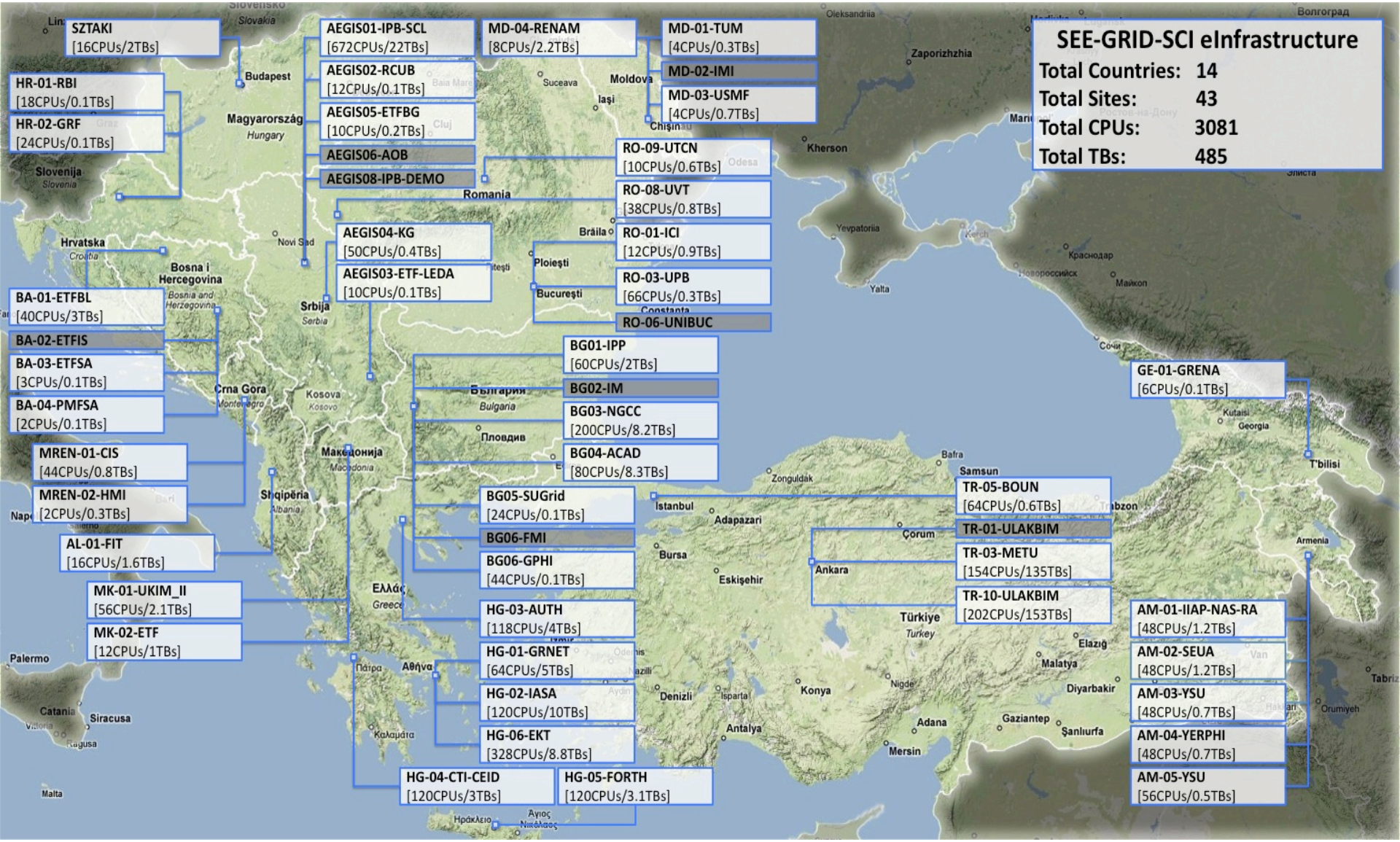






- Pan-European Grid
- South East European Grid
- Russian-Armenian
- Georgian-Armenian
- French National Grid'5000

# Grid Activities in Armenia: Interaction with SEE GRID SCI/ EGEE



# Grid Activities in Armenia: User Communities

- Biology
- Mathematics
- Informatics and Computer Science
- Astrophysics
- Meteorology
- Environmental Protection
- Seismology
- High Energy Physics
- Quantum Physics
- Cross-border user communities and beneficiaries

# Grid Activities in Armenia: Earth Science Applications

## Earth Science and Astrophysics Applications in Armenia: Present and Perspectives

H. Astsatryan, M. Gyurjyan, V. Sahakyan, Yu. Shoukourian, T. Khotsanyan, H. Keropyan
Institute for Informatics and Automation Problems,
National Academy of Sciences of the Republic of Armenia

### Armenian National Grid Infrastructure

- The Armenian National Grid infrastructure (416 cores) consists of seven Grid sites (see fig. 1) located in the leading research (National Academy of Sciences of the Republic of Armenia, Yerevan Physics Institute) and educational (Yerevan State University, State Engineering University of Armenia) organizations of Armenia.
- Apart from computing and storage resources, core Grid services which enable seamless access to all resources are provided to national users. The Armenian national VO ARMGRID.GRID.AM has been established in May 2009.
- The Armcluster (128 Xeon 3.06GHz processors) was the first high Performance computing cluster in the South Caucasus region developed in 2004.

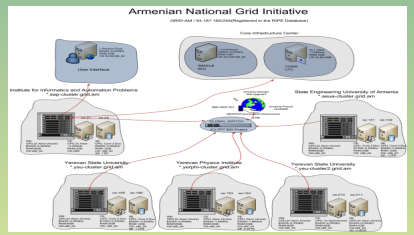



Figure 1: The structure of Armenian Grid Infrastructure

### Recent International Grid and Connectivity Projects

- SEE-GRID-SCI (South East European Grid eInfrastructure for regional eScience) Project co-funded by the European Commission leverages the SEE eInfrastructure to enable new scientific collaborations among user communities
- BSI (Black Sea Interconnection) Project co-funded by the European Commission intends bridging the digital divide that exists between the South Caucasus countries and Europe by establishing a regional research and education network in the South Caucasus and connecting it to GÉANT2.
- A-1451 (Development of Scientific Computing Grid on the Base of Armcluster for South Caucasus Region) Project funded by International Science and Technology Centre.
- A-1606 (Development of Armenian-Georgian Grid Infrastructure and applications in the Fields of High Energy Physics, Astrophysics and Quantum Physics) Project funded by International Science and Technology Centre.

**More Information: http://www.grid.am**

### Earth Science and Astrophysics Applications

#### Numerical Weather Prediction

The core of the numerical weather prediction system is the Weather Research and Forecasting model implemented and operationally used for the territory of Armenia (see fig. 2) by Armenian State Hydrometeorological and Monitoring Service. Initial condition data is taken from Meteo (downloaded from National Center for Environmental Prediction) database and the results of calculations are stored in the forecast database. The model serves as a basis for solving different problems (environmental, hydrological, etc).

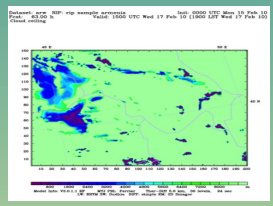


Figure 2: Model Output for the nested domain

#### Seismology

In Armenia the seismological data are collected from about thirty stations and stored at the servers of National Survey for Seismic Protection of Armenia. The seismology platform consists of the seismic data, AMGA Metadata Catalog, programming tools and applications (ELF, SRA, etc.) developed within the EU FP7 SEE GRID SCI Project.

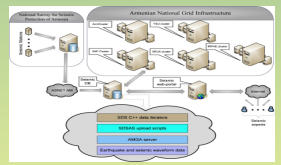


Figure 3: Seismology Platform

#### Air Pollution

The core of the air pollution system is the Air Quality (CMAQ) modeling system, which has been designed to approach air quality as a whole by including state-of-the-science capabilities for modeling multiple air quality issues, including tropospheric ozone, fine particles, toxics, acid deposition, and visibility degradation

#### Astrophysics

The Digitized First Byurakan Survey (DFBS) is the digitized version of the famous Markarian Survey, also known as the First Byurakan Survey (FBS). It is the largest low dispersion spectroscopic survey of the sky covering 17,000 square degrees at galactic latitudes |b|>15. DFBS provides the astronomical community with images and extracted spectra for all objects present in the FBS plates. Each plate contains low-dispersion spectra of some 15,000-20,000 objects, and there are some 20,000,000 objects in the whole survey. The Armenian Virtual Observatory is a member of International Virtual Observatory Alliance.

# THANK YOU